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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			HARRISON, MONICA D	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 03/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/673,375	Applicant(s) DIP ET AL.	
	Examiner Monica D. Harrison	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-51 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-51 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's amendment filed 9/2/05 has been entered. Examiner acknowledges newly admitted claims 47-51 which have also been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-6, 12, 27-40, 42-45 and 51 are rejected under 35 U.S.C. 102(e) as being anticipated by Luo et al (6,884,464 B2).

2. Regarding claim 1, Luo et al discloses a method of depositing a silicon-containing film on a substrate, the method comprising: providing a substrate in a process chamber of a processing system (Figure 1, reference 12); heating the substrate (Figure 1, reference 14); exposing a HCD process gas to the substrate (Figure 1, reference 16); and depositing a silicon or silicon-germanium film on the substrate using the HCD process gas (Figure 1, reference 16).

3. Regarding claim 2, Luo et al discloses wherein the exposing further comprises exposing an inert gas to the substrate (column 3, lines 58-60, N_2).

4. Regarding claim 3, Luo et al discloses wherein the exposing further comprises flowing the HCD gas at a flow rate between about 5 sccm and about 1,000 sccm and the inert gas at a flow rate between about 5 sccm and about 20,000 sccm (column 12, lines 10-24).

Art Unit: 2813

5. Regarding claim 4, Luo et al discloses wherein the exposing further comprises exposing a hydrogen-containing gas to the substrate (column 3, lines 65-67; NH_3).

6. Regarding claim 5, Luo et al discloses wherein the exposing further comprises exposing H_2 to the substrate (column 11, lines 55-58).

7. Regarding claim 6, Luo et al discloses wherein the exposing further comprises flowing a hydrogen-containing gas at a flow rate between about 5 sccm and about 5,000 sccm (column 11, lines 55-67 thru column 12, lines 1-6).

8. Regarding claim 12, Luo et al discloses wherein the exposing further comprises exposing a HCD gas and at least one of a phosphor-containing gas, a boron-containing gas, and a nitrogen-containing gas to the substrate (column 3, lines 65-67; NH_3).

9. Regarding claim 27, Luo et al discloses wherein the heating comprises heating the substrate to between about 500C and about 900C (Figure 1, reference 14).

10. Regarding claim 28, Luo et al discloses wherein the heating comprising heating the substrate to between about 700C and about 900C (Figure 1, reference 14).

11. Regarding claim 29, Luo et al discloses wherein the heating comprises heating the substrate to a temperature of about 800C and the depositing comprises selectively depositing an epitaxial silicon or silicon-germanium film on a silicon surface of the substrate (Figure 1, reference 14).

12. Regarding claim 30, Luo et al discloses wherein the heating comprises heating the substrate to a temperature of about 700C and the depositing comprises non-selectively depositing the silicon or silicon-germanium film on the substrate (Figure 1, reference 14).

Art Unit: 2813

13. Regarding claim 31, Luo et al discloses further comprising providing a process chamber pressure less than about 100 Torr (Figure 1, reference 14)

14. Regarding claim 32, Luo et al discloses further comprising providing a process chamber pressure less than about 10 Torr (Figure 1, reference 14).

15. Regarding claim 33, Luo et al discloses providing a process chamber pressure of about .4 Torr (Figure 1, reference 14)

16. Regarding claim 34, Luo et al discloses pretreating the substrate prior to exposing a HCD process gas to the substrate (column 11, lines 60-62).

17. Regarding claim 35, Luo et al discloses wherein the pretreating comprises exposing a H₂ gas to the substrate at a substrate temperature between about 500C and about 1000C (column 11, lines 47-60).

18. Regarding claim 36, Luo et al discloses wherein the pretreating comprises exposing a H₂ gas to the substrate at a substrate temperature of about 900C (column 11, lines 47-53).

19. Regarding claim 37, Luo et al discloses a computer readable medium containing program instructions for execution on a processor, which when executed by the processor, cause a processing apparatus to perform the steps in the method recited in claim 1 (Figure 3, reference 900).

20. Regarding claim 38, Luo et al discloses a system for processing a substrate, comprising: means for providing a substrate (Figure 3, reference 132) in a process chamber (Figure 3, reference 108) of a processing system (Figure 3); means for heating the substrate

Art Unit: 2813

(Figure 3, reference 104); means for exposing a HCD process gas to the substrate to deposit a silicon or silicon-germanium film on the substrate (Figure 3, reference 108).

21. Regarding claim 39, Luo et al discloses a processing tool for depositing a silicon or silicon-germanium film on a substrate comprising: a processing system (Figure 2A, reference 100); a transfer system configured to provide the substrate in a process chamber of the processing system (Figure 2A, reference 136); a heater for heating the substrate (Figure 2A, reference 104); a gas injection system configured to expose a HCD process gas to the substrate in the processing system to form a silicon or silicon-germanium film on the substrate (Figure 2A, reference 108); and a controller configured to control the processing tool (Figure 3, reference 900).

22. Regarding claim 40, Luo et al discloses wherein the processing system comprises a batch type processing system or a single wafer processing system (column 3, lines 42-43; *single wafer*).

23. Regarding claim 42, Luo et al discloses wherein the processing system comprises a thermal processing system, a plasma processing system, or an atomic layer deposition system (Figure 2A, reference 104; *thermal*).

24. Regarding claim 43, Luo et al discloses a processing system configured for pretreating the substrate (column 11, lines 60-62).

25. Regarding claim 44, Luo et al discloses further comprising a process monitoring system (Figure 3, reference 900).

26. Regarding claim 45, Luo et al discloses wherein the gas injection system is configured to expose a HCD process gas comprising HCD and an inert gas (column 3, lines 58-

Art Unit: 2813

60) and at least one of a hydrogen-containing gas, a silicon-containing gas, and a germanium-containing gas to the substrate (column 3, lines 65-67; NH_3).

27. Regarding claim 51, Luo et al discloses a method of depositing a silicon-containing film on a substrate, the method comprising: providing a substrate in a process chamber of a processing system (Figure 1, reference 12); heating the substrate (Figure 1, reference 14); exposing a HCD process gas to the substrate (Figure 1, reference 16); and depositing a silicon-containing non-insulating film on the substrate using the HCD process gas (Figure 1, reference 16).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7-11, 13-24, 41 and 46-50 rejected under 35 U.S.C. 103(a) as being unpatentable over Luo et al (6,884,464 B2) in view of Seutter et al (2003/0215570 A1).

28. Luo et al discloses all above claimed subject matter except a second silicon containing gas (claim 7), exposing SiH_4 , $SiCl_4$, Si_2H_6 , SiH_2Cl_2 to the substrate (claim 8), second silicon containing gas at a specified flow rate (claim 9), exposing a hydrogen containing gas and a second silicon containing gas to the substrate (claim 10), exposing H_2 and at least one of SiH_4 , $SiCl_4$, Si_2H_6 , SiH_2Cl_2 to the substrate (claim 11), exposing a HCD gas and at least one of PH_3 , B_2H_6 , BCl_3 , and NH_3 to the substrate (claim 13), exposing a halogen-containing gas to the substrate (claim 14), exposing at least one of HF , F_2 , Cl_2 , and HCl to the substrate (claim 15),

Art Unit: 2813

exposing a germanium-containing gas to the substrate (claim 16), exposing a at least one of a hydrogen-containing gas, a dopant gas, and a halogen-containing gas substrate (claim 17), exposing at least one of GeH_4 and GeCl_4 to the substrate (claim 18), exposing a hydrogen-containing gas and a germanium-containing gas to the substrate (claim 19), exposing H_2 and GeH_4 to the substrate (claim 20), selectively depositing an epitaxial silicon-containing film on a silicon substrate (claim 21), non-selectively depositing a polycrystalline silicon-containing film or an amorphous silicon-containing film on a substrate (claim 22), exposing a HCD process gas including HCD gas and a germanium-containing gas to the substrate; depositing a SiGe-containing film on the substrate (claim 23), selectively depositing a SiGe-containing film on a silicon surface (claim 24), and a batch type processing system containing a process tube (claim 41), expose a HCD process gas comprising HCD and an inert gas and at least one of a dopant gas and a halogen-containing gas to the substrate (claim 46), selectively depositing an epitaxial Si film on a crystalline Si substrate (claim 47), selectively depositing an epitaxial Si film on a crystalline SiGe substrate (claim 48), selectively depositing an epitaxial SiGe film on a crystalline Si substrate (claim 49), and selectively depositing an epitaxial SiGe film on a crystalline SiGe substrate (claim 50).

Seutter et al discloses a second silicon containing gas (pg.2, paragraph 0022), exposing SiH_4 , SiCl_4 , Si_2H_6 , SiH_2Cl_2 to the substrate (pg.2, paragraph 0022), second silicon containing gas at a specified flow rate (pg.2, paragraph 0022), exposing a hydrogen containing gas and a second silicon containing gas to the substrate (pg.2, paragraph 0022), exposing H_2 and at least one of SiH_4 , SiCl_4 , Si_2H_6 , SiH_2Cl_2 to the substrate (pg.2, paragraph 0022), exposing a HCD gas and at least one of PH_3 , B_2H_6 , BCl_3 , and NH_3 to the substrate (pg.2, paragraph 0022; NH_3), exposing a

Art Unit: 2813

halogen-containing gas to the substrate (pg.4, paragraph 0031), exposing at least one of HF, F₂, Cl₂, and HCl to the substrate (pg.4, paragraph 0031), exposing a germanium-containing gas to the substrate (pg.2, paragraph 0023), exposing at least one of a hydrogen-containing gas, a dopant gas, and a halogen-containing gas substrate (pg.2, paragraph 0022; NH₃), exposing at least one of GeH₄ and GeCl₄ to the substrate (pg. 2, paragraph 0023), exposing a hydrogen-containing gas and a germanium-containing gas to the substrate (pg.2, paragraph 0023), exposing H₂ and GeH₄ to the substrate (pg.2, paragraph 0023), selectively depositing an epitaxial silicon-containing film on a silicon substrate (pg.2, paragraph 0019), non-selectively depositing a polycrystalline silicon-containing film or an amorphous silicon-containing film on a substrate (pg.2, paragraph 0019), exposing a HCD process gas including HCD gas and a germanium-containing gas to the substrate; and the depositing comprises depositing a SiGe-containing film on the substrate (pg.2, paragraphs 0022-0023), selectively depositing a SiGe-containing film on a silicon surface (pg.2, paragraph 0023), a batch type processing system containing a process tube (pp.7-8, examples 1-5), expose a HCD process gas comprising HCD and an inert gas and at least one of a dopant gas and a halogen-containing gas to the substrate (pg.4, paragraph 0031; *chlorine*), selectively depositing an epitaxial Si film on a crystalline Si substrate (pg.2, paragraph 0019), selectively depositing an epitaxial Si film on a crystalline SiGe substrate (pg.2, paragraph 0019), selectively depositing an epitaxial SiGe film on a crystalline Si substrate (pg.2, paragraphs 0022-0023), and selectively depositing an epitaxial SiGe film on a crystalline SiGe substrate (pg.2, paragraphs 0022-0023).

Art Unit: 2813

It is obvious, at the time the invention was made, for one having ordinary skill in the art, to modify Luo et al with the teachings of Seutter et al, for the purpose of creating a method and apparatus for depositing a silicon nitride film by cyclical layer deposition.

Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Luo et al (6,884,464 B2) and Seutter et al (2003/0215570 A1).

29. Luo et al and Seutter et al disclose all above claimed subject matter except depositing a SiGe film containing having a germanium content below about two atomic percent (claim 25) and depositing a SiGe film containing having a germanium content greater than about two atomic percent (claim 26).

Seutter et al discloses the SiGe film (pg.2, paragraphs 0022-0023) however, Seutter et al does not disclose the specified atomic percents.

It is obvious, at the time the invention was made, for one having ordinary skill in the art, to deposit a silicon germanium film with a germanium content above and below two atomic percent, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the "optimum range" involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (1955).

Response to Arguments

30. Applicant's arguments with respect to claims 1-51 have been considered but are moot in view of the new ground(s) of rejection.

Art Unit: 2813

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy, as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica D. Harrison whose telephone number is 571-272-1959. The examiner can normally be reached on M-F 7:00am-3:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2813

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Monica D. Harrison
AU 2813

mdh
February 24, 2006


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